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NATIONAL ADVISORY COMMITTEE FOR AERONAUTICS.

*Technical Memorandum No. 2.*VARIABLE PITCH PROPELLERS.

Translated from
L'Aeronautique, Sept. 30, 1920.
By D.L. Bacon, Assistant Physicist,
Aerodynamical Laboratory, N.A.C.A.,
Langley Field, Va.

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Memorial
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From National Advisory Committee
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Washington, D. C.

VARIABLE PITCH PROPELLERS.

Translated from L'Aeronautique, September 30, 1920.

Our readers have already seen, from Colonel Dorand's noteworthy article* the importance of the variable pitch propeller. It is only by the use of such a device that a supercharged motor may be used to greatest advantage at all altitudes.

We here describe four different types of propeller which appeared at widely separated dates but which were exhibited together at the last Salon de l'Aeronautique.

The Chauviere Variable Pitch Propeller.

Although this is an old type of variable pitch propeller, the principle of operation is still interesting from a mechanical standpoint.

The propeller blades each carry at the butt end a toothed sector meshing with a bevel gear integrally formed with the spur gear A adjacent to which is a second spur gear B of the same diameter, rigidly attached to the propeller hub. Two internal gears C and D surround these and mesh with them through the intermediary of two trains of planets a, b, c, all rotating freely on their axis. Ring

*L'Aeronautique, No. 2, July, 1919.

D is held stationary but C may be rotated by the pilot about the axis O-O'. It is obvious that, regardless of the rotation of the propeller, any rotation of C with respect to D causes a corresponding displacement of A relative to B, thus changing the angle of the blades.

The Variable Pitch Propeller used on the
Clement Bayard Dirigible.

The wooden blades are held in two metallic sockets which are swivelled in sleeves attached to the propeller hub, a thrust bearing holding the blades against centrifugal force. A bevel gear, concentric with the axis of rotation, is meshed with two bevel sectors fastened to the ends of the blades. The shaft on which this bevel gear is mounted is cut with helical grooves which are engaged by fingers projecting internally from a sliding collar surrounding the driving shaft. This collar is moved by the pilot through a control rod operating against a ball thrust bearing.

This propeller is also arranged so that the thrust may be measured. In order to accomplish this the driving shaft is made in two sections and the torque is transmitted from one to the other by means of lugs bearing on rollers, thus permitting longitudinal motion. Thrust is resisted by a manometric capsule, by means of which it can be measured.

Variable Pitch Propeller Used on Italian
Dirigibles.

This propeller has four blades and is built entirely of metal. The inner end of each blade is cylindrical in form and is pivoted in a socket in the hub where it is held by suitable bearings against centrifugal force. Each blade carries a small lug, joined by a link to a central control rod located inside the hollow drive shaft. This rod is splined to the shaft but may slide axially, thus causing the blades to rotate about their own axes. Control is effected through a collar surrounding the shaft, operated by means of a rack and pinion acting against a ball thrust bearing.

The Levasseur Variable Pitch Propeller.

Each blade is built up of wooden laminations in which are securely embedded the ends of eight threaded rods. The butt end, which is cylindrical, fits into a steel cup, the bottom of which is pierced by eight holes through which the ends of the rods project. These are held by nuts on the outside in order to resist centrifugal force. A cap, the internal bore of which is conical, is screwed onto the other end of the cup. This fits a corresponding conical portion of the wooden blade and serves to hold it against vibration and may be used to take up any looseness resulting

from shrinkage of the wood. The cup swivels in a bronze bushel steel socket formed in two halves A and B which are integral with the hub and take both radial and thrust loads. A collar C surrounds the blade between these two halves and carries a lug which is connected to a sliding collar D by means of the link tt'. This collar is splined to the shaft by the key C and can slide longitudinally. It is obvious that by moving this collar any desired values of pitch, either positive or negative, may be obtained. The position of the collar D is determined, through a ball thrust bearing, by the sleeve M screwed onto an extension of the crankcase. This sleeve M may be rotated by means of a pinion meshing with teeth cut in its outer surface, thus transmitting to the collar D a sliding motion along the shaft.

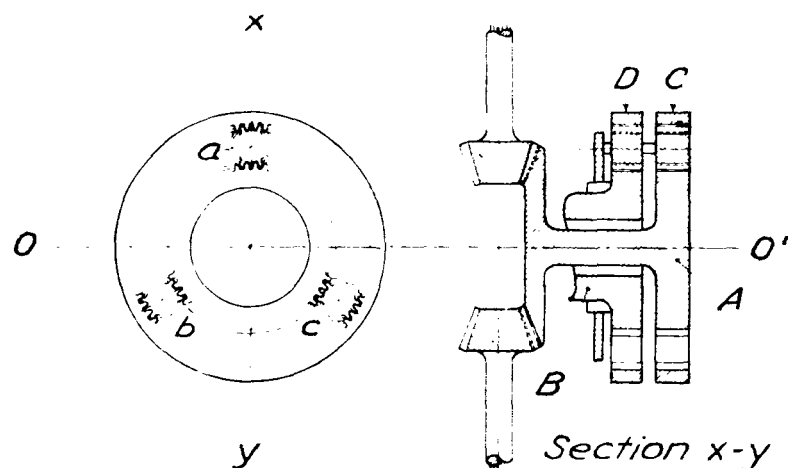


Diagram of CHAUVIÈRE Variable Pitch Propeller
(1913)

Diagram of Variable Pitch
Propeller used on the
CLEMENT-BAYARD DIRIGIBLE

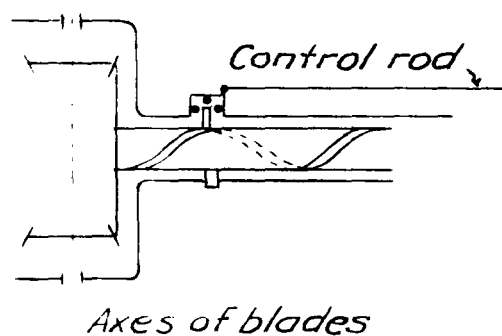


Diagram of Variable Pitch
Propeller used on
ITALIAN DIRIGIBLES

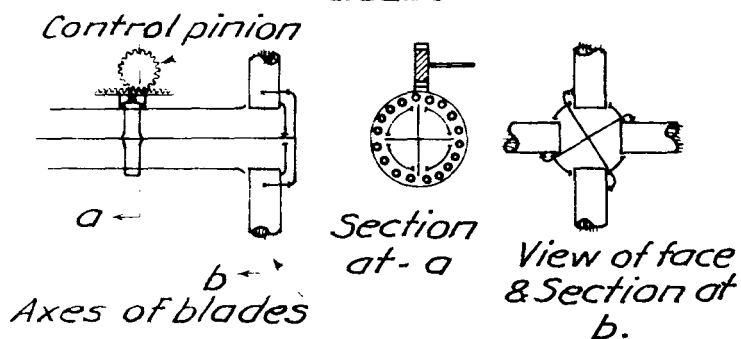


Diagram of the LEVASSEUR Variable Pitch Propeller.

